



(RESEARCH ARTICLE)



## Studies on earthworm population densities in garbage area at urban environment Hyderabad, Telangana State, India

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### Abstract

Earthworms are known to produce vermicompost by using any organic waste like agricultural waste, city garbage, industrial waste and sewage waste and helps in reducing noxious gases of a wide variety of organic water, eliminating the bad smell. Soil animals are important component of ecosystem functioning in urban domestic garbage and the earthworms are one of the major groups of these animals in the sewage and garbage. Thus, it is important to know the significance of earthworms and in our study we want to find out the factors that diminish the earthworms' population in garbage.

**Keywords:** Earthworm; Vermicompost; Garbage; Population; Environment

### 1. Introduction

The distribution of earthworms is usually diverse and their population fluctuates in relation to the different physico-chemical properties and land use patterns of the soil of southern parts of India [1]. Earthworms are known to produce vermicompost by using any organic waste like agricultural waste, city garbage, industrial waste and sewage waste. Earthworms in Nature play a major role in converting any organic waste into vermicompost, which helps in reducing noxious gases of a wide variety of organic water, eliminating the bad smell. It makes soil porous resulting in improved water infiltration, moisture retention hence it is good for rain fed and dry land crop. It arrests soil erosion through rainfall & irrigation and improves shelf like following cellulolytic microorganisms help in hastening decomposition [2].

Earthworms are little wriggling worms that inhabit the soil system. These invertebrates, belong to the phylum-Annelid, Order-Oligochaeta, Class-Clitellata. They range from a fraction of a cm to one or two meters on length, and commonly known as the farmer's friend. They have been considered as a "Sacred animals." [3].

In 1980s, the scene has been set for use of earthworms in applied problems for the first time although they were used in the bait market since the time immemorial. It stimulated interest in earthworm technology such as vermiculture and vermicomposting. There was an increasing interest in use of earthworms in land reclamation and soil improvement and in the use of earthworms as bioindicators of environmental contamination by toxic chemicals. However, most of the information is available about earthworms of temperate regions, and unfortunately very little is known about these aspects in tropics [4].

The activity of earthworms in tropics is observed only during the wet-season of the year, which has been given less importance and neglected and whose significance is little appreciated by the farmers. Knowledge of functional role of tropical earthworms as components of ecosystems, is at the best, fragmentary (Satchell, 1972).

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Very little quantitative data is available on the ecological influence of earthworms on urban domestic garbage. In India, although some ecological information is available on the earthworms of Bangalore in Karnataka, Madras in Tamilnadu, Berhampur and Sambalpur in Orissa, no information is available on the ecology of earthworms of Sambalpur in Orissa, no information is available on the ecology of earthworms of Deccan Peninsula with the semi-arid dry weather and high temperature conditions prevailing most of the parts of the year that being less favorable for earthworms populations, and their growth and multiplication [5].

The reasons for such shortage of quantities information may be because of the fact that the earthworms are so omnipresent that the need for research on the fact that the earthworms are so omnipresent that the need for research on the relation between earthworm activity and ecosystem productivity is limited [6,7]. The decomposition of garbage in urban domestic nutrient content and rate of nutrient recycling in the whole sewage and garbage in urban system [8]. However, nutrient cycling in garbage is poorly understood. Soil animals are important component of ecosystem functioning in urban domestic garbage and the earthworms are one of the major groups of these animals in the sewage and garbage [9,10].

As mentioned earlier they play very important role in decomposing of garbage in soil, which is defined as that nutrient fraction of the soil accessible to plant roots and depends on the chemical and physical status of the nutrients in the soil [11]. Thus, it is important to know the significance of earthworms and also to find out the factors that diminish the earthworms' population in garbage. Nevertheless, attempts were made to investigate some aspects of the ecology of earthworms of sewage and garbage of urban systems, which is a prerequisite to research on their role in decomposition, diversity and density in the sewage, and garbage of urban environment, Hyderabad.

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## 2. Material and methods

### 2.1. Study Area

The Present investigation was carried out at Nagole near Uppal Area, Hyderabad (Latitude 17.3814909, Longitude 78.5551322 & Altitude of 536 mts to mean sea level), Deccan plateau of Telangana region, India, Garbage domestic area during Jan 2017 to Jan 2018. Soil samples were collected from garbage areas while sampling the earthworms for analysis of soil physical-chemical characteristics and also recorded climate and pedology

### 2.2. Methodology

The earthworms were sampled by hard sorting method in three randomly selected areas, each of size 25x25 cm and 25 cm depth in each plot (replicate) every month during two crop seasons. (July to September, and June to October, each covering both rainy (June to September) and Post training (October to January) seasons. Thus, their populations were sampled eight times in total period, each time, an iron grid of 25 cm<sup>2</sup> size was placed on the randomly selected area and cleared up the above ground vegetation inside the frame and dug up to the depth of 25 cm in the morning hours (0600 to 0800 hrs.) The earthworms were searched and collected from each such area, put in a polythene bag and brought to the laboratory. They were washed of the adhered soil particles, soaked with filter paper to remove the water attached to their outer body wall and their number was enumerated. They were weighed (with gut content) for biomass (wet), narcotized with absolute ethanol, and sorted into various age groups such as adults (with clitellum) and juveniles (without clitellum and small worms) Table 1. They were processed through 4% formalin overnight, and preserved in 80% ethanol. The adults identified approximately, sent for more (specific) identification to expert taxonomist at Zoological Survey of India.

Their population densities were converted to m<sup>-2</sup> across 15 treatments. The data on the population densities of adult and juvenile earthworms and their biomass across the soil management treatments and seasons were analyzed by ANOVA using GENSTAT.

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## 3. Results and discussion

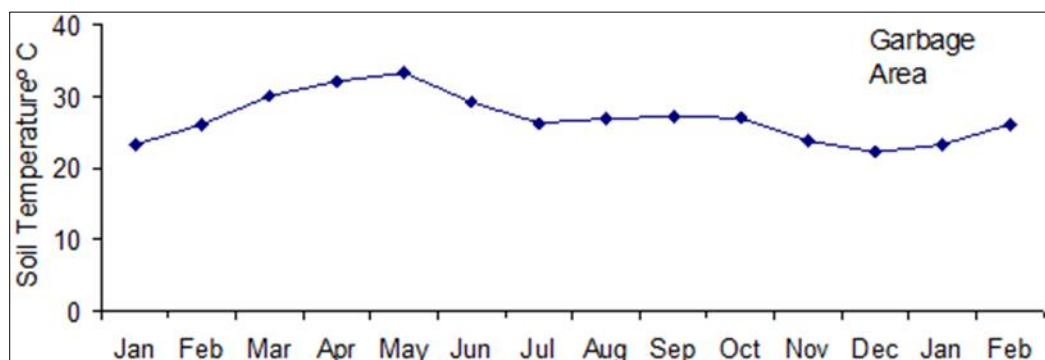
Most of the chemicals in soil primary compound are more related to the population of earthworms are organic carbon (oc), k<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub> were shown in Table 2. Earthworm population was recorded in garbage area and the population was more in month of June. 12 earthworms are occurring in m<sup>2</sup> area. Adults are more recorded than juveniles in month of January 2017 & 2018(60%), March (75%), April (100%), May (100%), July (60%), and October (60%) 2017. Juveniles are recorded more than adults in month of February (60%), June (58.3%), September (60%), November (75%), December (66.6%) 2017. Table 3.

**Table 1** Number of earthworms collected from m2 area in Garbage area during the study period

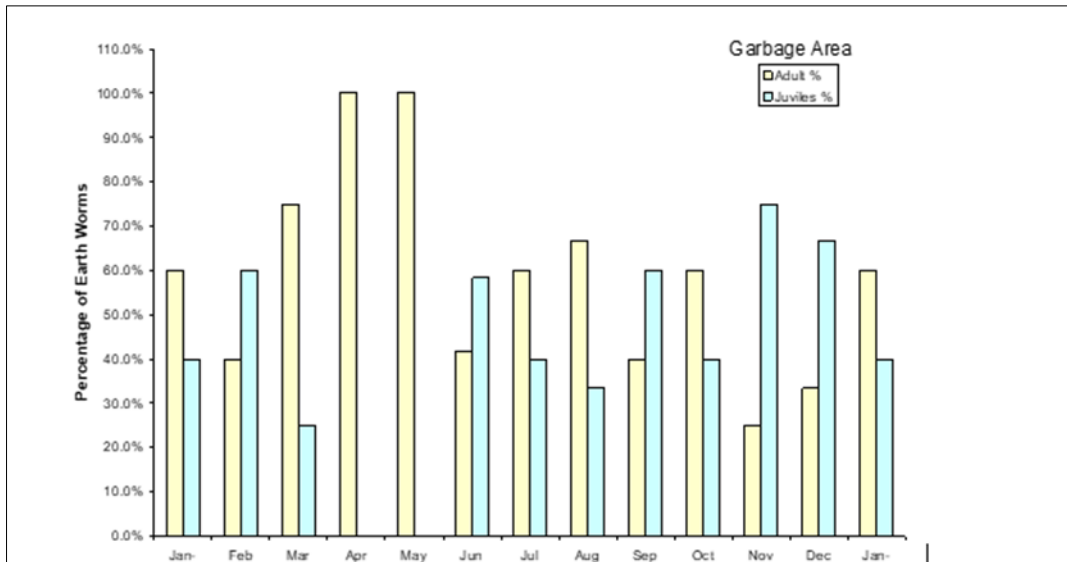
Month	Total No. of Adults	Total No. of Juviniles	Adult Min length Cm.	Adult Max length Cm.	Juvinile Min length Cm.	Juvinile Max length Cm.
Jan	3	2	6	16	3	5
Feb	2	3	5	7	8	9
Mar	3	1	8.5	16.5	5.5	5.5
Apr	1	0	15	15	0	0
May	1	0	12.5	12.5	0	0
Jun	5	7	8	20	5.5	12
Jul	6	4	10.5	18	7	10
Aug	6	3	5	19	5.5	7.5
Sep	2	3	15	19	8.5	10
Oct	3	2	7	16.5	10	11
Nov	1	3	8.5	8.5	5	6
Dec	1	2	12.5	12.5	6	8
Jan	3	2	6	16	3	5

**Table 2** Some physical characteristics of the soil of garbage areas during the study period

Area	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	OC	N
GARBAGE	1027.7 Kg/ha-1 high	848Kg/ha-1 high	0.75% Medium	200.197 Kg/ha-1 Low



**Figure 1** Monthly Variations of Soil Temperature at Garbage Area During Study Period



**Figure 2** Seasonal Variations of Adults and Juveniles of earthworms during Study Period

**Table 3** Percentage of Earthworms in Garbage Area During the Study Period

Month	Adult	Juveniles	Adult %	Juveniles %
Jan	3	2	60.0%	40.0%
Feb	2	3	40.0%	60.0%
Mar	3	1	75.0%	25.0%
Apr	1	0	100.0%	0.0%
May	1	0	100.0%	0.0%
Jun	5	7	41.7%	58.3%
Jul	6	4	60.0%	40.0%
Aug	6	3	66.7%	33.3%
Sep	2	3	40.0%	60.0%
Oct	3	2	60.0%	40.0%
Nov	1	3	25.0%	75.0%
Dec	1	2	33.3%	66.7%
Jan	3	2	60.0%	40.0%

#### 4. Conclusion

Earthworms are known to play important roles in soil profile development, nutrient cycling, and plant productivity where their population densities are high. The activity of earthworms in tropics is observed only during the wet-season of the year, which has been given less importance and neglected and whose significance is little appreciated by the farmers. Earthworms play very important role in decomposing of garbage in soil, which is defined as that nutrient fraction of the soil accessible to plant roots and depends on the chemical and physical status of the nutrients in the soil. In south India, the species diversity of earthworms is very less and the earthworm activity is less in garbage, which may be because of unfavorable environmental conditions. In garbage area, in months of January, March to May, July to August, October & December, adults were more than juveniles. Remaining months of February, April, June, September, November juveniles are more than adults.

## Compliance with ethical standards

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